

**US-PAT-NO:** 6054063**DOCUMENT-IDENTIFIER:** US 6054063 A**TITLE:** Method for plasma treatment and apparatus for plasma treatment

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**Brief Summary Text - BSTX (8):**

Furthermore, charge accumulation on the substrate can be almost completely eliminated by allowing the negative ion generated in plasma at low electron temperatures, to hit a substrate, together with a positive ion, at a low-frequency bias of 600 KHz or less. FIG. 4 shows dependency of accumulated charge on pulse OFF time in chlorine ECR plasma. Charge accumulation can be suppressed when the OFF time is 50 .mu.sec or more and the amount of negative ion generated is large. Thus, when the electron temperature and electron density are low and the plasma is constituted by positive and negative ions and, under such conditions, a low-frequency RF bias is applied to a substrate, the positive and negative ions hit the substrate alternately and charge accumulation on the substrate can be suppressed.

**Brief Summary Text - BSTX (18):**

Suppressing of the overshoot of electron temperature can be achieved by allowing the applied pulse to have an inclination during the rise. That causes the amount of negative ions in the plasma increase, and the charge accumulation to decrease reduced. This is because no large power is applied to the plasma during pulse application and the generation of high-energy electrons is suppressed. Increase in the amount of electrons having an energy of 1 eV or less produces negative ions efficiently in after-glow, resulting in increase in the amount of negative ions. Therefore, the electron temperature and the electron density are low and a plasma comprising positive and negative ions alone is generated stably, making possible reduction in charge accumulation.